

NASA ADVISORY COUNCIL
National Aeronautics and Space Administration
Washington, DC 20546
Hon. Harrison H. Schmitt, Chairman

August 17, 2007

The Honorable Michael D. Griffin
Administrator
National Aeronautics and Space Administration
Washington, DC 20546

Mike
Dear Dr. Griffin:

Attached please find NASA Advisory Council recommendations agreed to in a public meeting on July 19, 2007. Three of the attached recommendations were proposed by the Science Committee and two by the Exploration Committee. As you can see, the recommendations from the Exploration Committee are applicable to NASA as a whole.

A summary of each recommendation is below with background for each enclosed.

Exploration Committee

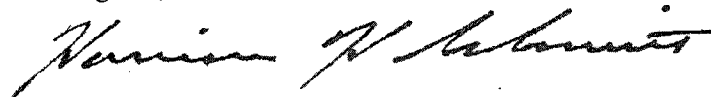
- 1) **Vulnerability Assessment of Operational Cyber-Security:** Engage in a thorough review of NASA envisioned IT architecture and cyber security plan. (NAC-07-2)
- 2) **NASA-wide management of avionics, electronics, software, materials, and mechanical component maturity:** Establish a NASA-wide activity to manage avionics, electronics, software, materials, and mechanical components that balances using proven but near-obsolete components and system architectures. (NAC-07-3)

Science Committee

- 3) **NASA Earth Science Initiative:** Present to the Science Committee at the February 2008 meeting the revised Earth Science plan, including independent cost comparisons, for the response to the 2007 NRC decadal survey, and a comparison of the FY 09 budget elements relative to the decadal survey recommendations and budget assumptions, along with accompanying rationale. (S-07-1)
- 4) **Free-Flier Satellites for Climate Monitoring:** Continue to work with NOAA on the implementation of long-term monitoring of the selected climate variables from space that have been eliminated from the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Mission, particularly with respect to the potential of climate free-flier satellites. (S-07-2)
- 5) **Earth Observation from the Earth-Moon L1 point:** The Lunar Exploration Architecture should recognize that satellites at the Earth-Moon L1 point supporting lunar operations would also provide excellent platforms for observing the full Earth sphere and its environs. (S-07-3)

If there are any questions on these recommendations, please contact me.

Best Regards,



Harrison H. Schmitt
Chairman

Enclosures

NASA Advisory Council
Council Recommendation
[Tracking Number NAC-07-02](#)

Committee Name: Exploration Committee

Chair: Gen. James Abrahamson

Date of Public Deliberation: July 19, 2007

Date of Transmission: August 17, 2007

Short title of Recommendation

Vulnerability Assessment of Operational Cyber-Security for NASA Missions

Short description of Recommendation

It is recommended that NASA engage in a thorough review of its envisioned IT architecture and cyber security plan. Emphasis should be on the identification of potential internet-based vulnerabilities associated with operational systems (e.g., design, development, testing, command and control, public engagement, science projects, etc). Human space flight is an especially attractive target for terrorists, and NASA should examine all operational command and control systems for vulnerabilities. We recommend that NASA leverage Department of Defense (DoD) efforts in this area. In particular, studies and recommendations by the Air Force Science Advisory Board (SAB) may be of assistance.

Major reasons for the Recommendation

DoD experience and recent studies by the Defense Science Board (DSB), and most recently the AF SAB, have illuminated substantial vulnerabilities and made recommendations about the way forward. NASA missions, particularly human missions, are very high-value targets for terrorists and other actors. It is important that NASA have confidence in the security and safety of its command and control systems. Additionally, while the Internet offers greatly improved capabilities for public engagement, it also opens new vulnerabilities.

Consequences of no action on the Recommendation

No action on this recommendation would reduce confidence in NASA's ability to operate its missions safely and effectively and increase the hazards and associated risks to spaceflight and associated activities.

NASA Advisory Council
Council Recommendation
[Tracking Number NAC-07-03](#)

Committee Name: Exploration

Chair: Gen. James Abrahamson

Date of Public Deliberation: July 19, 2007

Date of transmission: August 17, 2007

Short title of the Recommendation

NASA-wide management of avionics, electronics, software, materials, and mechanical component maturity

Short description of the Recommendation

Establish a NASA-wide activity to manage avionics, electronics, software, materials, and mechanical components that balances using proven but near- obsolete components and system architectures versus employing architectures that enable growth and technology evolution and future block upgrades as well as components that are lighter, smaller, better performing, and consume less power. This activity should:

1. Ensure that all elements of ESMD operational systems employ an architecture which will enable upgrades of electronics and software over the many years these systems will be operated.
2. Establish a process that continually reviews available avionics, electronics, software, materials, and mechanical component technologies, independent of source, and evaluates their suitability for insertion into EMSD programs.
3. Broadly transmit the above goals and this activity within NASA's government and contractor engineering, design, and testing communities.
4. Develop a "living" communications plan to ensure that RFPs, RFIs, AOs, proposal evaluation criteria, and other NASA communications encourage the appropriate level of advanced technology, standards, and protocols.
5. Establish an evaluation process to measure progress in implementing this process in all areas of NASA R&D, in the ethos of the NASA/contractor workforce, and in the exploration project implementation. Use this information to continually improve the process.
6. Make the Ares launch vehicle family the first system to be reviewed.

Major reasons for the Recommendation

The recommendation is made to achieve the following goals:

1. Ensuring NASA's future electronic systems safely fulfill its new missions while simultaneously using the best of proven new electronic and software technologies for the indefinite future.
2. Assuring the best performance for the least weight, space and power.
3. Minimizing electronics and software systems life cycle costs.
4. Exploiting the best of technologies developed and proven in other industries.
5. Furthering NASA's reputation for being associated with leading edge technology in order to continue to attract the best minds to NASA's endeavors.

Consequences of no action on the Recommendation

Significant penalties may be paid in cost per pound to orbit, and in life cycle costs if avionics, electronics, software, materials, and mechanical component utilization are managed with too low a risk tolerance.

NASA Advisory Council
Council Recommendation
[Tracking Number S-07-1](#)

Subcommittee Name: Science

Chair: Edward E. David

Date of Public Deliberation: July 19, 2007

Date of Transmission: August 17, 2007

Short title of Recommendation

Action on NASA Earth Science Initiative Needed by FY09

Short description of Recommendation

NASA should present to the Science Committee at the February 2008 meeting the revised Earth Science plan, including independent cost comparisons, for the response to the 2007 NRC decadal survey, and a comparison of the FY 09 budget elements relative to the decadal survey recommendations and budget assumptions, along with accompanying rationale.

Major reasons for the Recommendation

The Earth Science community produced its first NRC decadal survey in January 2007. The survey highlights the need for Earth observation from space to meet societal as well as scientific challenges. It presents a strategy meeting requirements for simultaneous observation of key components of the Earth system. There exists a mismatch between the budget proposed in the Decadal Survey, and the cost assumptions that determine that budget, and NASA's FY08 out-year budget. However, Congress has not yet acted on the FY08 budget, and the Administration has not yet submitted its FY09 request. The Science Committee endorses the steps NASA has already taken to respond to the decadal survey: independent cost estimation of missions; discussion with potential international partners; and validation of mission concept science via community workshops. But the next steps to develop a plan are crucial to maximizing scientific returns within available resources.

Consequences of no action on the Recommendation

Without the comparisons between budgets and the 2007 decadal survey outlined above, the Council, and the outside science community, will have great difficulty in assessing NASA's response and the feasible progress it enables relative to decadal survey recommendations and other potential earth science needs.

NASA Advisory Council
Council Recommendation
[Tracking Number S-07-2](#)

Committee Name: Science

Chair: Edward E. David

Date of Public Deliberation: July 19, 2007

Date of Transmission: August 17, 2007

Short title of Recommendation

Free-Flier Satellites for Climate Monitoring

Short description of Recommendation

NASA should continue to work with NOAA on the implementation of long-term monitoring of the selected climate variables from space that have been eliminated from the National Polar-orbiting Operational Environmental Satellite System (NPOESS) Mission. The Council recommends that such monitoring should be conducted from “climate free-flier” satellites for reasons of both reliability and cost.

Major reasons for the Recommendation

Long-term, continuous, well-calibrated measurements of key climate variables from space are critical for monitoring climate variability and change, and for testing our understanding of the same. The Nunn-McCurdy certified NPOESS program emphasizes continuity of weather measurements. Long-term climate observations should not be held hostage to NPOESS’s other priorities. Four of the de-manifested sensors are for climate records that are between 15 and 25 years in length. Thus, the current NPOESS situation will interrupt critical Earth observations from space. “Climate free-flier satellites”, as described in options 2 and 3 of the NASA/NOAA White Paper titled, “Impacts of NPOESS Nunn-McCurdy Certification on Joint NASA-NOAA Climate Goals” (Jan. 8, 2007), are the best options for continuous observation. While NOAA now has budget and implementation responsibility for these specific activities, NASA, as the space agency, can assist with satellite development.

The NPOESS climate sensors TSIS, APS, OMPS-Limb, ERBS, and ALT [see acronym list at bottom of recommendation] were de-manifested as part of the recent Nunn-McCurdy Certification. CMIS was partly maintained but with reduced capability. OSTP tasked NASA and NOAA to examine options for recovering the ensemble of NPOESS climate measurements through other means. NASA presented to our Earth Science Subcommittee four options presently under consideration in their joint discussions with NOAA. Options 1 and 4 involve restoration of the climate sensors on later NPOESS satellites, while options 2 and 3 abandon the association with NPOESS and instead rely on “climate free-flier” satellites to carry the climate sensors. Options 2 and 3 are the best choices for reasons of both cost and reliability.

Consequences of no action on the Recommendation

The nation risks losing critical continuity in measurements of key climate variables during a prolonged period when such knowledge is directly relevant to current policy considerations within the Administration and the Congress.

TSIS	Total Solar Irradiance Sensor
APS	Aerosol Polarimeter Sensor
OMPS-Limb	Ocean mapping and Profiler Suite – Limb Subsystem
ERBS	Earth Radiation Budget Sensor
ALT	Ocean Altimeter

NASA Advisory Council
Council Recommendation
[Tracking Number S-07-3](#)

Committee Name: Science

Chair: Edward E. David

Date of Public Deliberation: July 19, 2007

Date of Transmission: August 17, 2007

Short title of Recommendation

Earth Observation from the Earth-Moon L1 point

Short description of Recommendation

The Lunar Exploration Architecture should recognize that satellites at the Earth-Moon L1 point supporting lunar operations would also provide excellent platforms for observing the full Earth sphere and its environs. [*Addition to S-07-ESS-2 from the Tempe Workshop*]

Major reasons for the Recommendation

At the Tempe Workshop (Science Associated with the Lunar Exploration Architecture, Feb 2007), the notional lunar outpost site at the Moon's south pole, on the rim of Shackleton crater, was considered to be unacceptable for Earth observation because of its very limited view of the Earth. An observatory location on an Earth-facing slope near the south-pole site, such as at Mt. Malapert, would afford better Earth viewing capability. An outpost location more centrally located on the Moon's Earth-facing hemisphere would provide an even more optimal Earth-observing location. This addition to recommendation S-07-ESS-2 is intended to indicate that the Earth-Moon L1 point also provides an excellent location from which to observe the Earth and that access to Earth-Moon L1 enabled by the lunar exploration architecture would be of considerable interest to the scientific community. This topic was addressed in the Tempe Workshop, but was not fully captured in the recommendations derived from the Earth Science Subcommittee deliberations.

Consequences of no action on the Recommendation

Consideration of options within the VSE and the lunar exploration architecture related to observations of the entire Earth and its environs would be significantly incomplete.